Problems & Prospects of Polio Eradication (wild virus)

Challenges & solutions

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4 countries and polar spectrum of ease / difficulty

- Recognize there is spectrum; one cut does not fit all

- Wild virus transmission is “highly contagious”
- Transmission efficiency (R_0) is spectral, proportional to “density of infants”, determined by population density & birth rate
- The “bar” for “immunization” efficiency is set by this spectrum

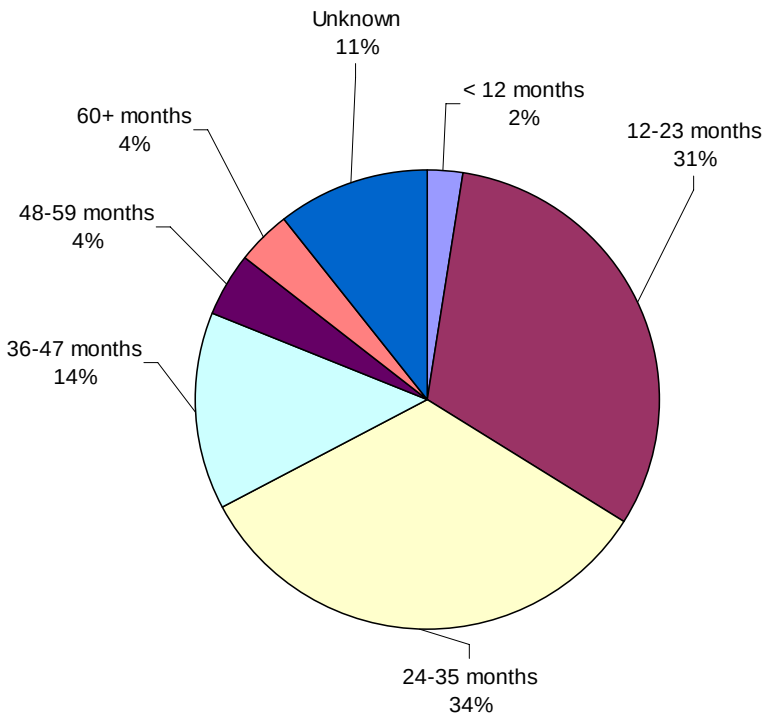
- OPV efficiency is also spectral; high, medium and low
- The “bar” for “vaccination” (doses, timeliness) is set by this spectrum

- UP/Bihar: worse ends of both spectra coincide; challenge is formidable
- Pakistan & Afghanistan have features of Nigeria & India

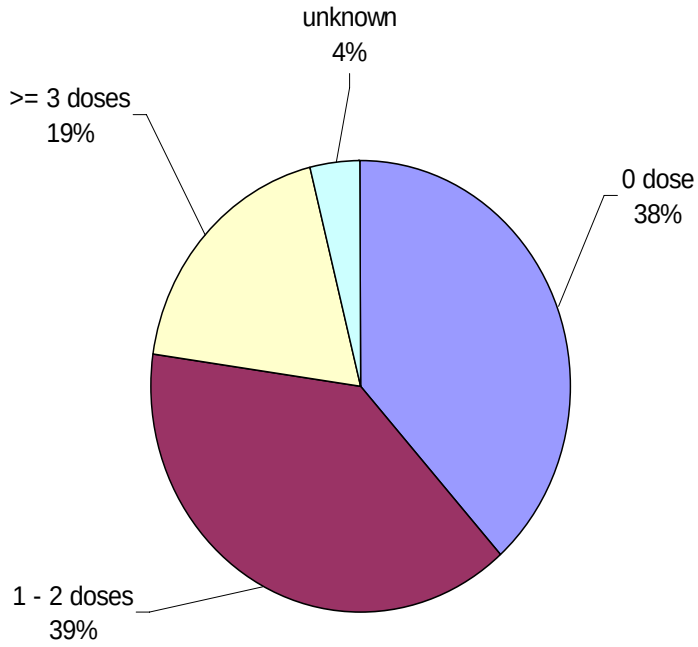
- Challenges: mix of “failure of vaccine” and “failure to vaccinate”

Age and OPV status of Wild Poliovirus Cases, 2006, Nigeria.

Age



OPV

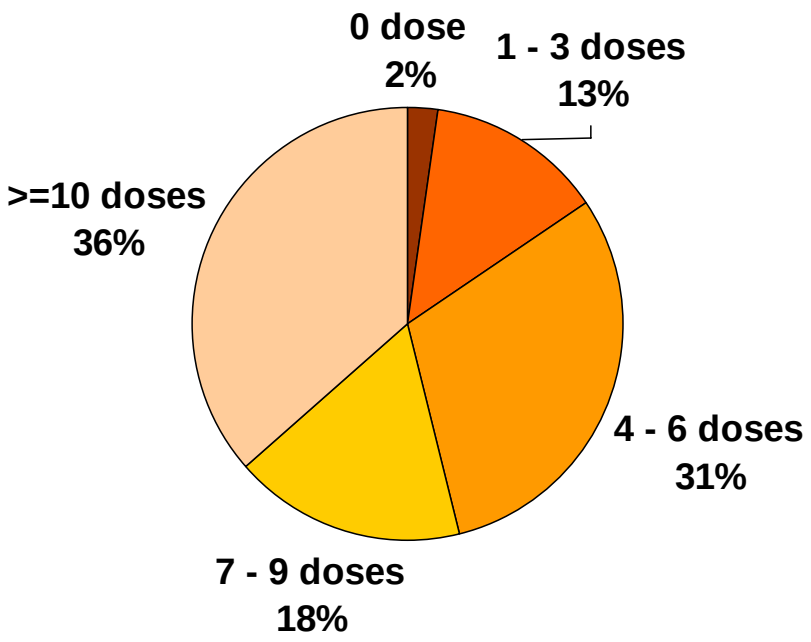


Nigeria, summary of polio

- Only 2% <12 months, 33% <24 months
- Median age 30 months
- No OPV in 38%, < 3 doses in 77%
- 3 or more doses (“vaccine failure”) 19%
- Clear case of failure to vaccinate + failure of vaccine
- Contrast that with India (UP, Bihar)

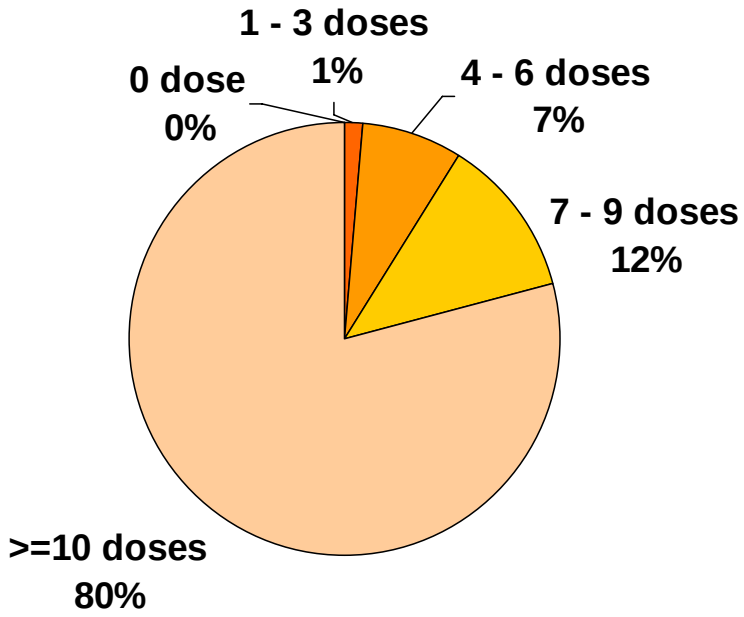
OPV status of AFP cases, UP, 2006*

Polio



(N=473)

Non-polio
(age >=6 months and age < 5 years)



(N=6749)

Polio cases have fewer doses of vaccine than others.
Children with more vaccine doses are less likely to get polio.

* data as on 2nd December, 2006

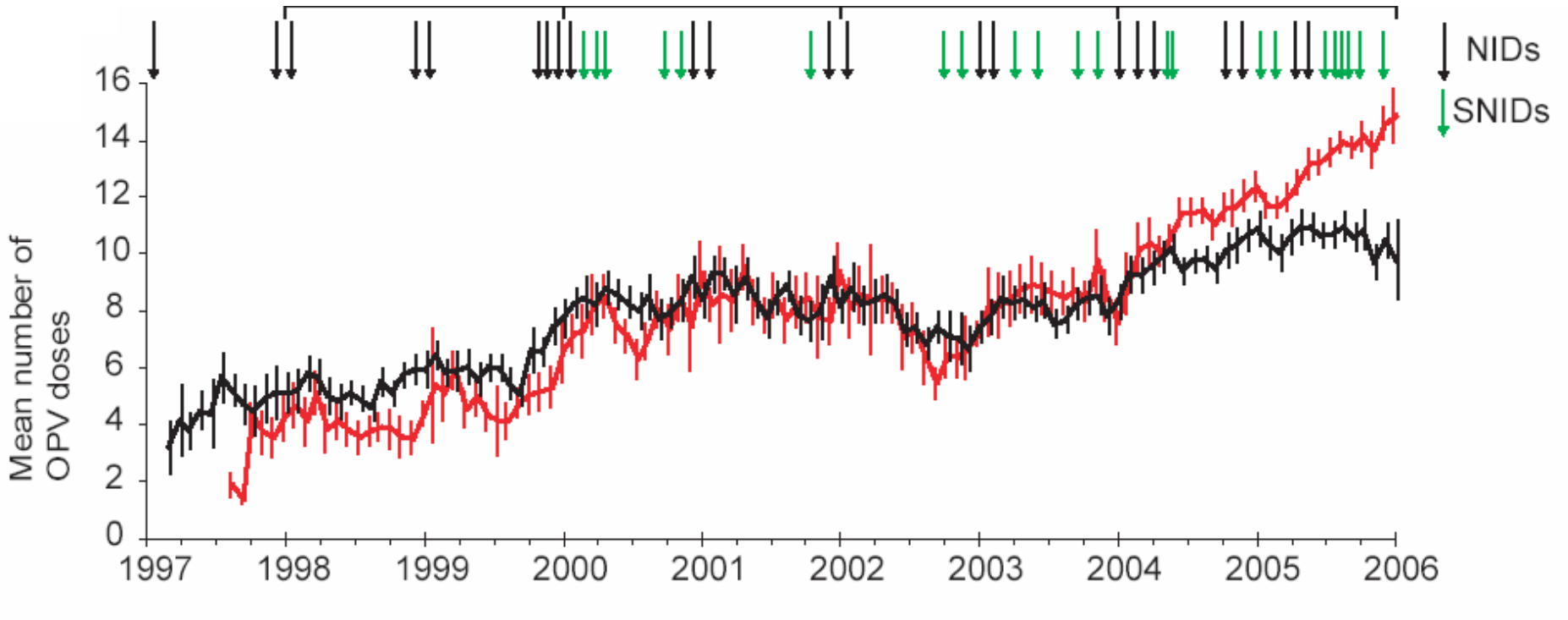
UP, summary of polio

- No OPV in 2%; 85% with 4 or more doses
- 54% with 7 or more doses; 36% with 10 or more

- Clear case of “failure of vaccine”
- (Mis-diagnosed as failure to vaccinate: blaming falsification, Muslims etc. until 2006 study!)

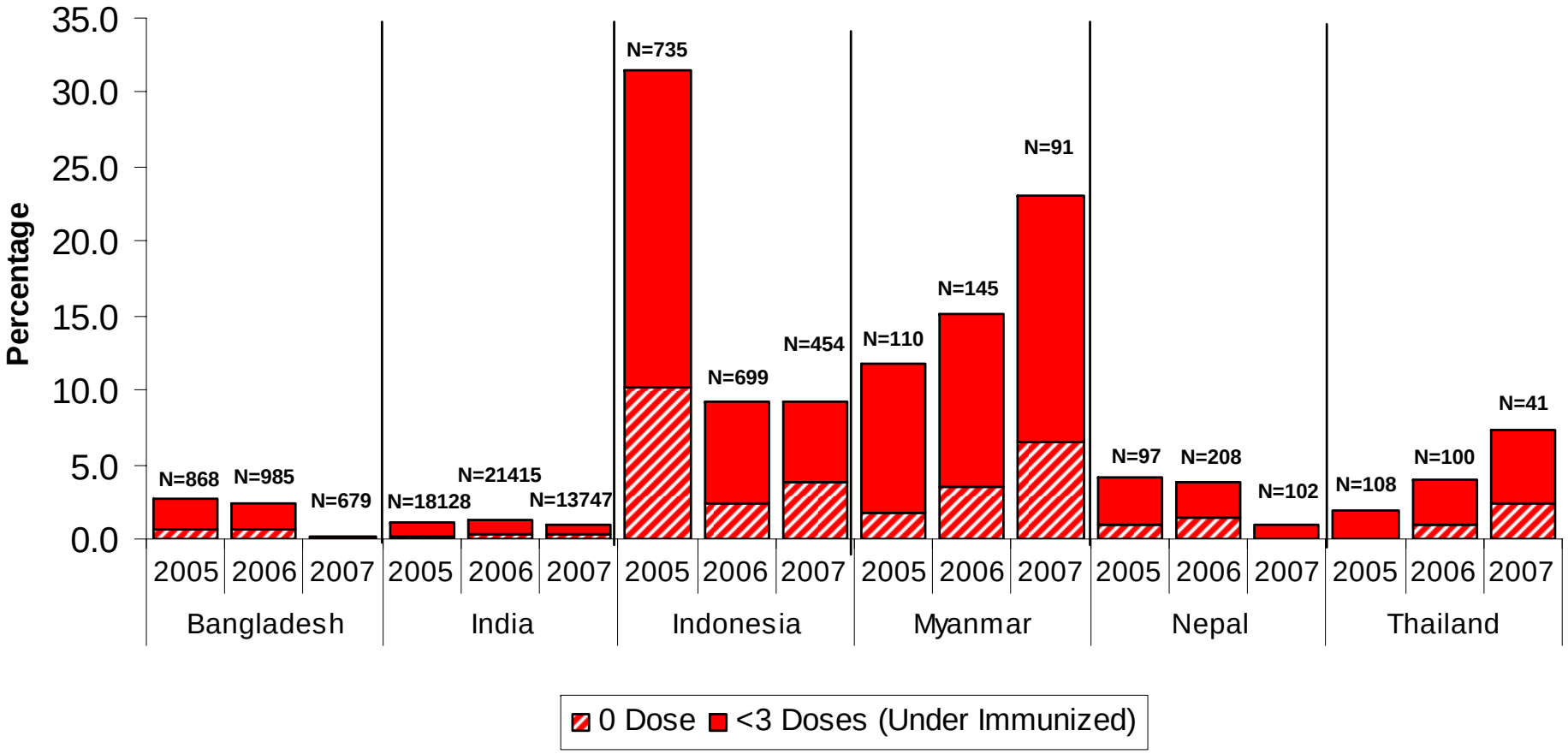
- However, note high vaccination coverage is for 6 months to 5 years. Mean doses 15/child
- <6 months ignored (very low vaccination coverage
- “Failure to vaccinate” the right age!

Average number of doses of OPV received by children less than 5



UP, Bihar in red
Rest of India, in black

Percent Under-immunized Non-Polio AFP Cases (6 Months to 5 Yrs), SEAR, 2005-2007



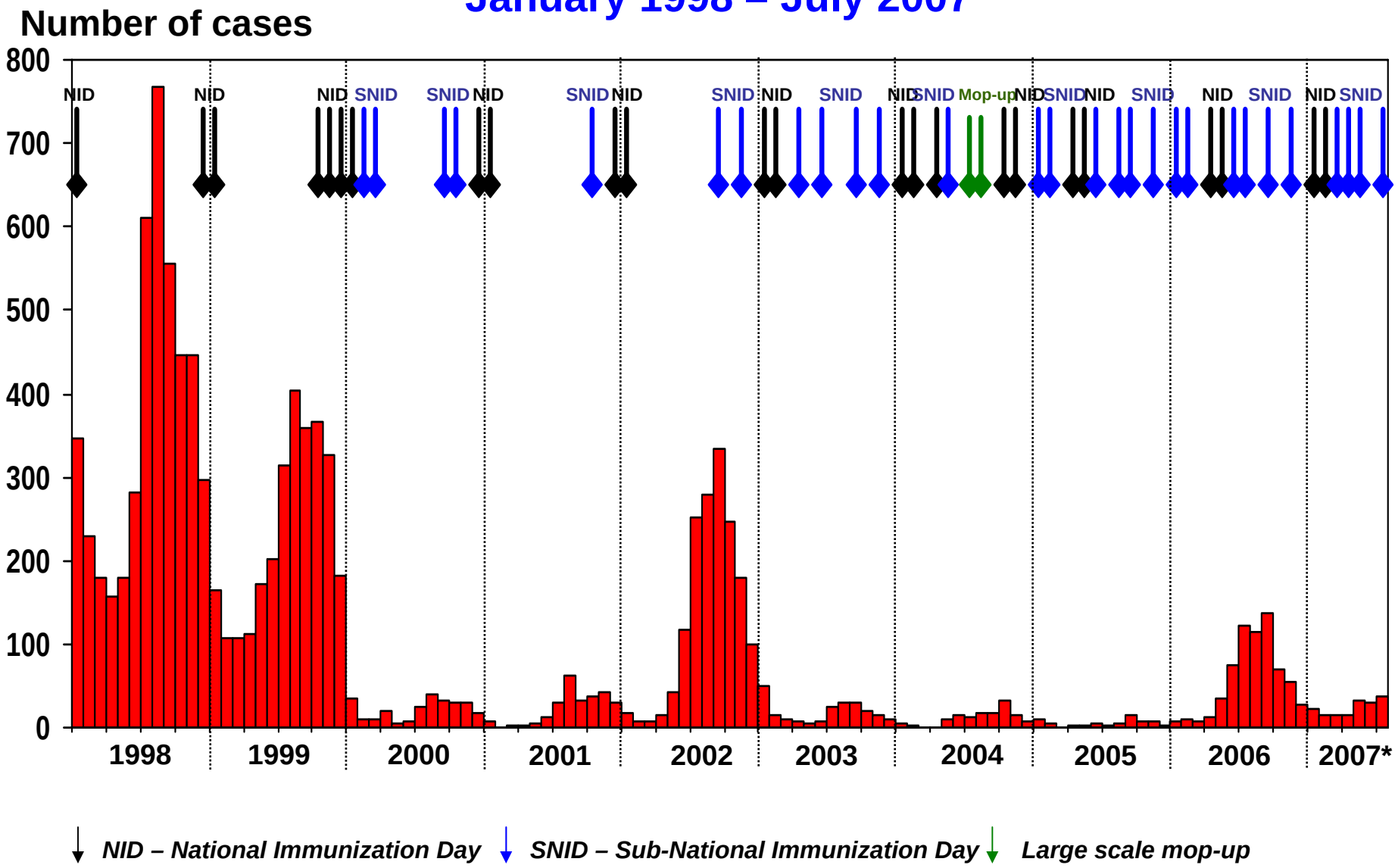
Source: AFP data submitted weekly by member countries.

Note: Does not include cases where doses information is missing or unknown.

Data as of 03 Sep 2007

Polio cases by month - India

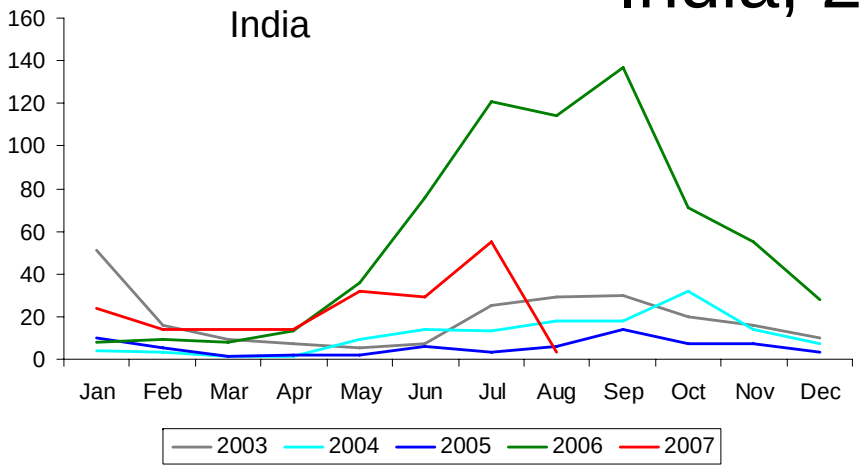
January 1998 – July 2007*

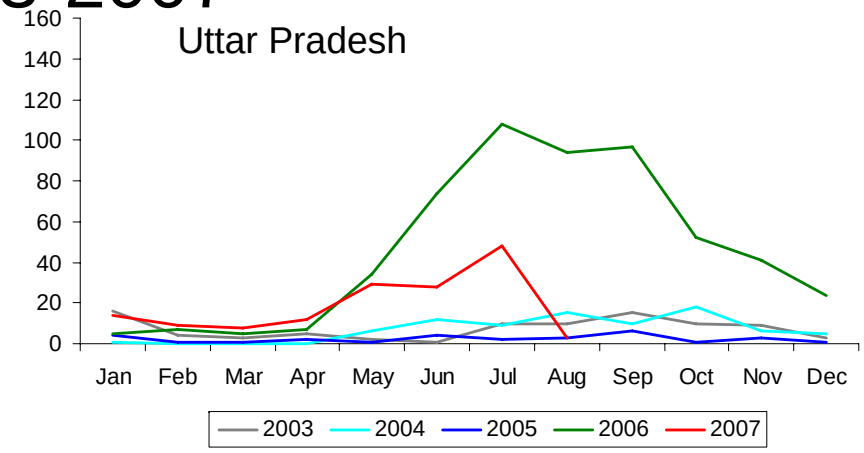


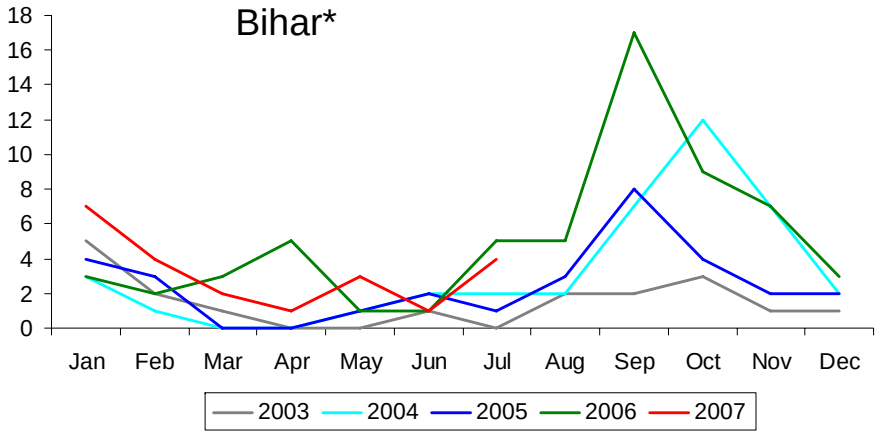
NID – National Immunization Day *SNID – Sub-National Immunization Day* *Large scale mop-up*

** data as on 18th August 2007*

Polio Cases by Month of Onset
India, 2003-2007







	India					Uttar Pradesh					Bihar				
MONTH	2003	2004	2005	2006	2007	2003	2004	2005	2006	2007	2003	2004	2005	2006	2007
Jan	51	4	10	8	24	16	1	4	5	14	5	3	4	3	7
Feb	16	3	5	9	14	4	0	1	7	9	2	1	3	2	4
Mar	9	1	1	8	14	3	0	1	5	8	1	0	0	3	2
Apr	7	1	2	13	14	5	0	2	7	12	0	0	0	5	1
May	5	9	2	36	32	2	6	1	34	29	0	1	1	1	3
Jun	7	14	6	76	29	1	12	4	74	28	1	2	2	1	1
Jul	25	13	3	121	55	10	9	2	108	48	0	2	1	5	4
Aug	29	18	6	114	3	10	15	3	94	3	2	2	3	5	
Sep	30	18	14	137		15	10	6	97		2	7	8	17	
Oct	20	32	7	71		10	18	1	52		3	12	4	9	
Nov	16	14	7	55		9	6	3	41		1	7	2	7	
Dec	10	7	3	28		3	5	1	24		1	2	2	3	
Total	**225**	**134**	**66**	**676**	**185**	**88**	**82**	**29**	**548**	**151**	**18**	**39**	**30**	**61**	**22**

*Please note: The Bihar graph is on a different scale on the Y-axis.

Data as of 03 Sep 2007

OPV Supplementary Immunization Activities (SIAs) SEAR, 2006-2007

Country	2006												2007											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Bangladesh																								
Bhutan																								
DPR Korea																								
India																								
Indonesia																								
Maldives																								
Myanmar																								
Nepal																								
Sri Lanka																								
Thailand																								
Timor Leste																								

Note: Please provide any updates to SEARO EPIDATA (epidata@searo.who.int).

-- NIDs

-- SNIDs @ > 40%+

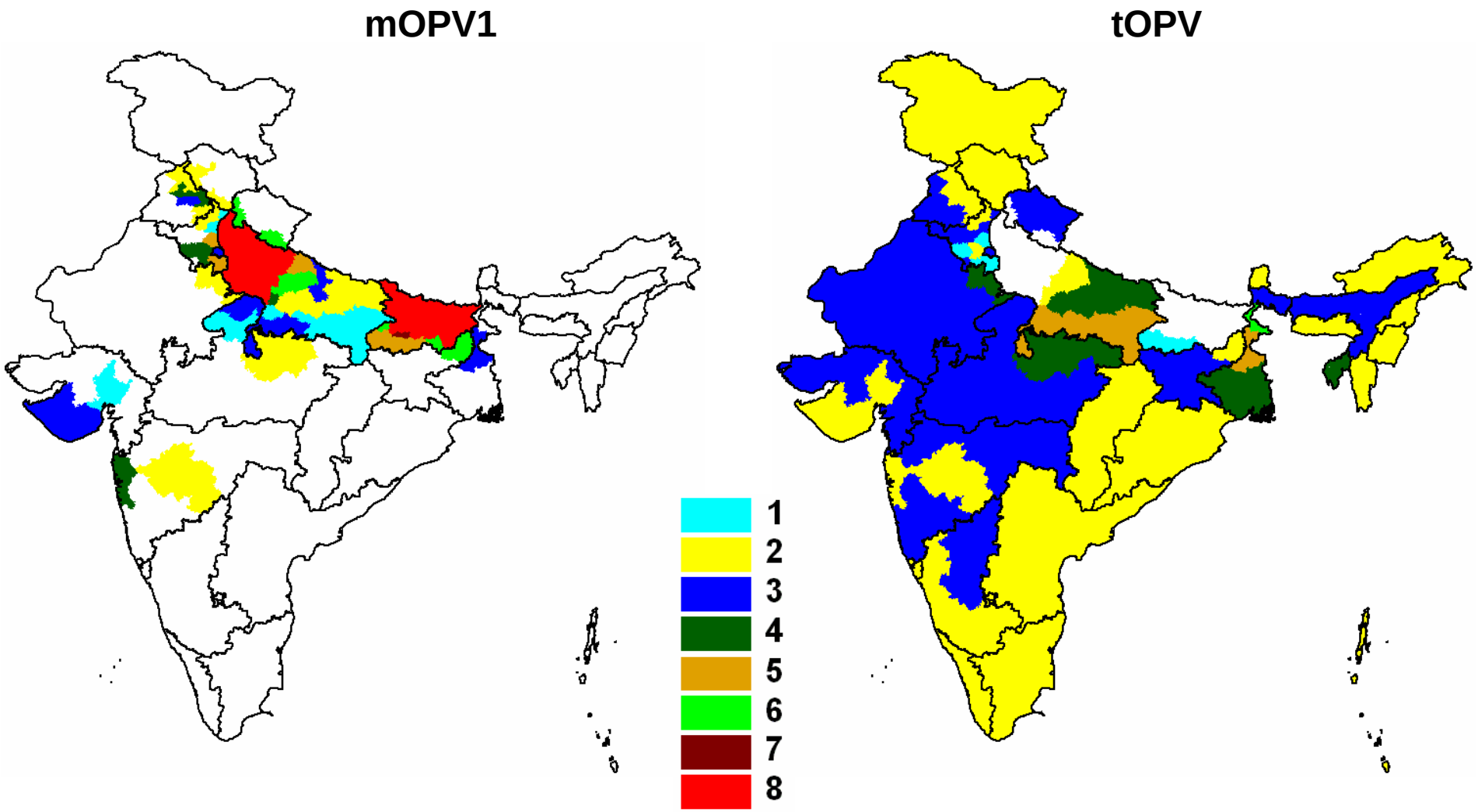
-- SNIDs @ < 40%

-- Proposed NIDs/SNIDs

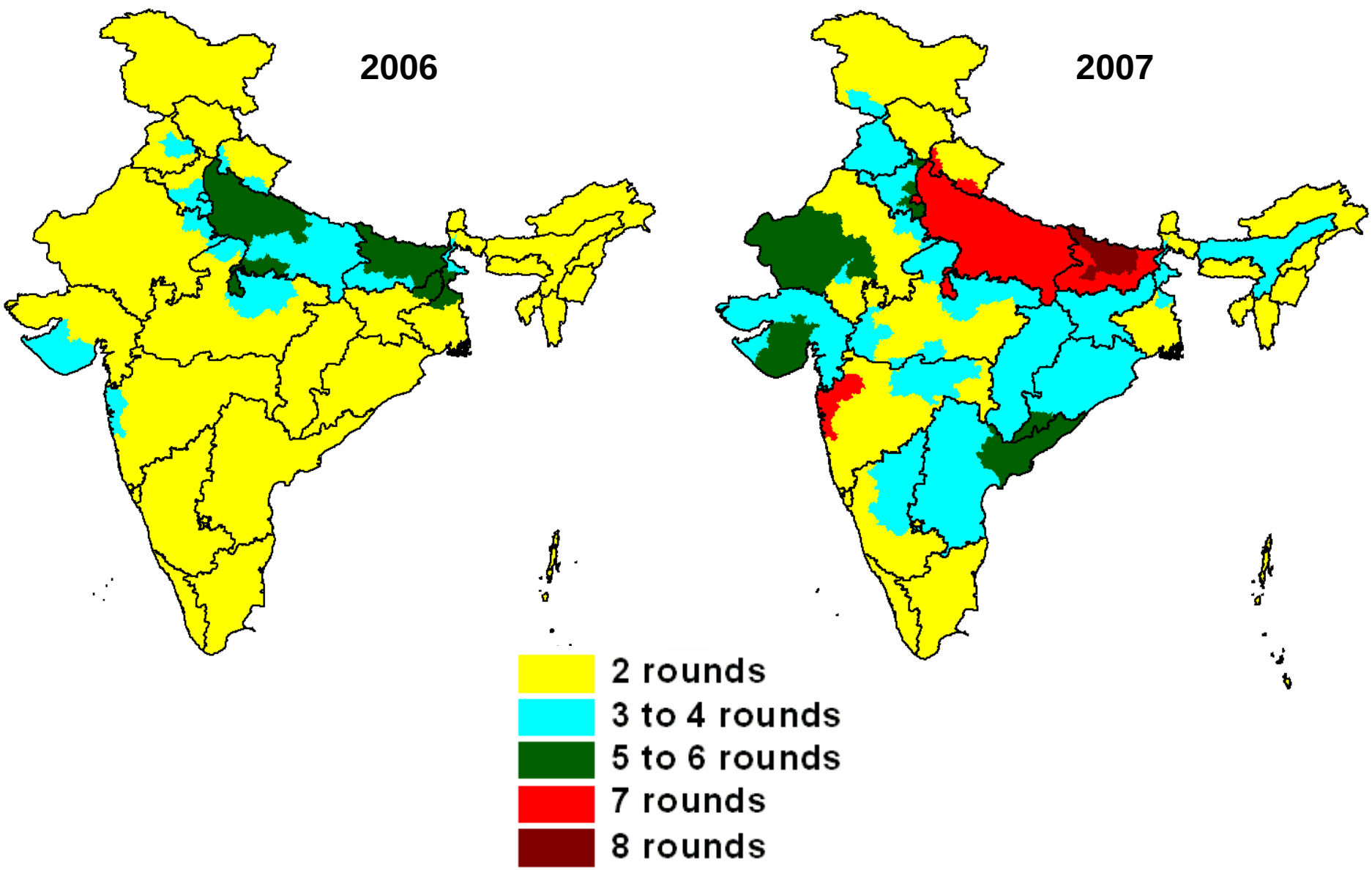
-- 2 rounds of SNIDs @ < 40%

Updated 03 Sep 2007

Has the large-scale use of mOPV1 in 2006 had an impact?



SIA rounds, Jan to Aug

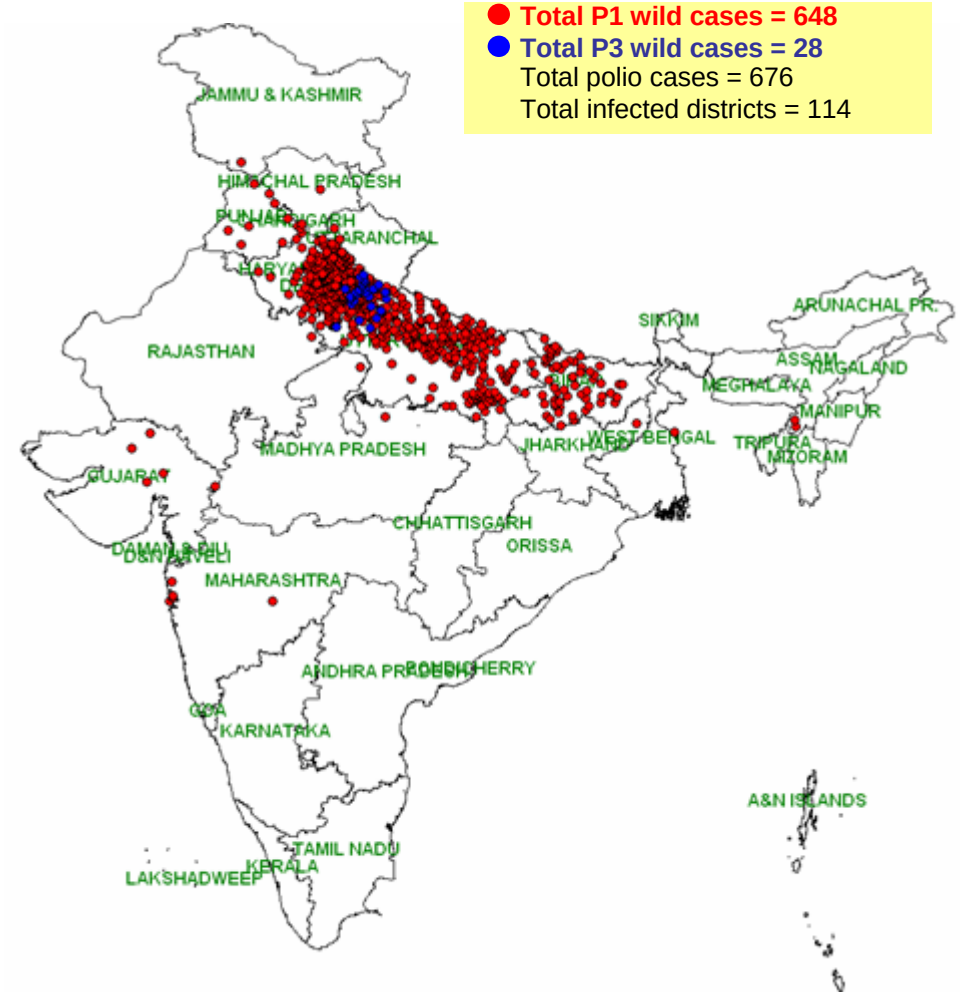


Confirmed Polio Cases
India, 2006-2007

2006

- Total P1 wild cases = 648
- Total P3 wild cases = 28

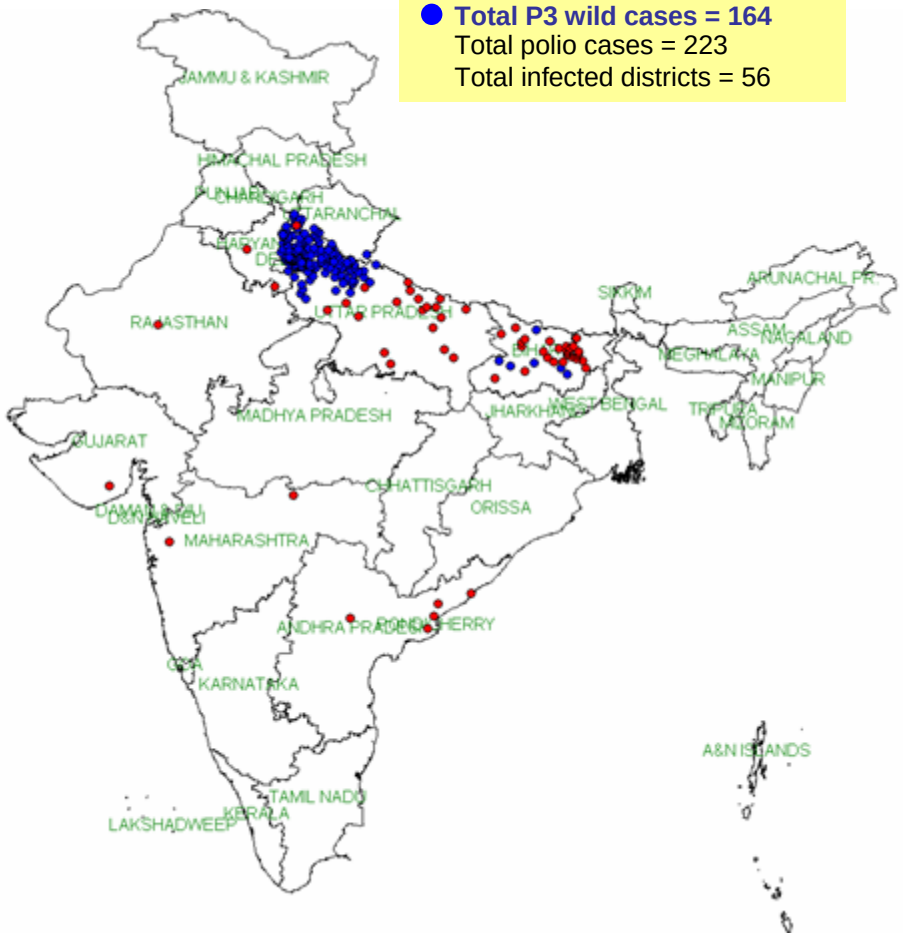
Total polio cases = 676
Total infected districts = 114



2007

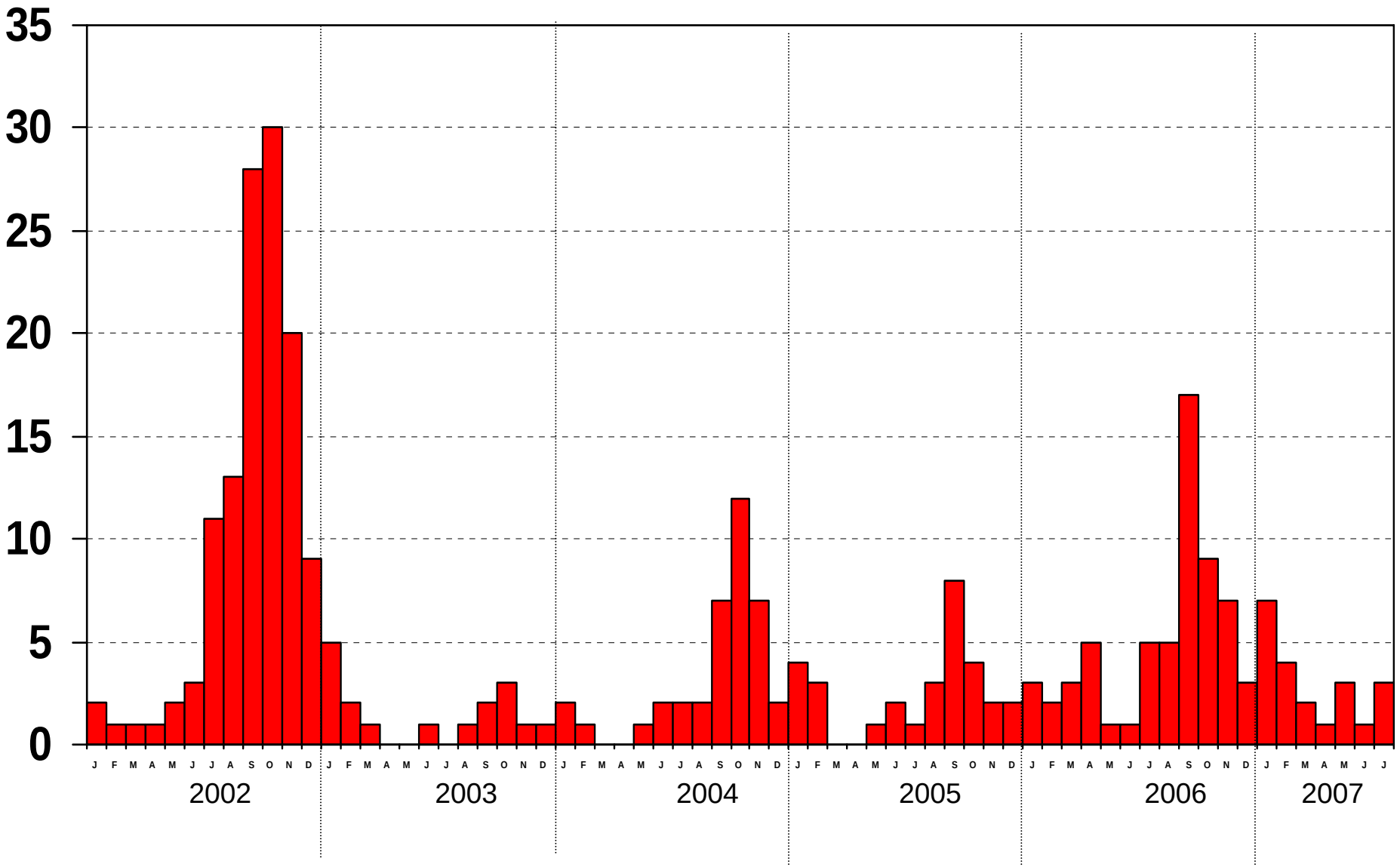
- Total P1 wild cases =59
- Total P3 wild cases = 164

Total polio cases = 223
Total infected districts = 56



Data as of 17 Sep 2007

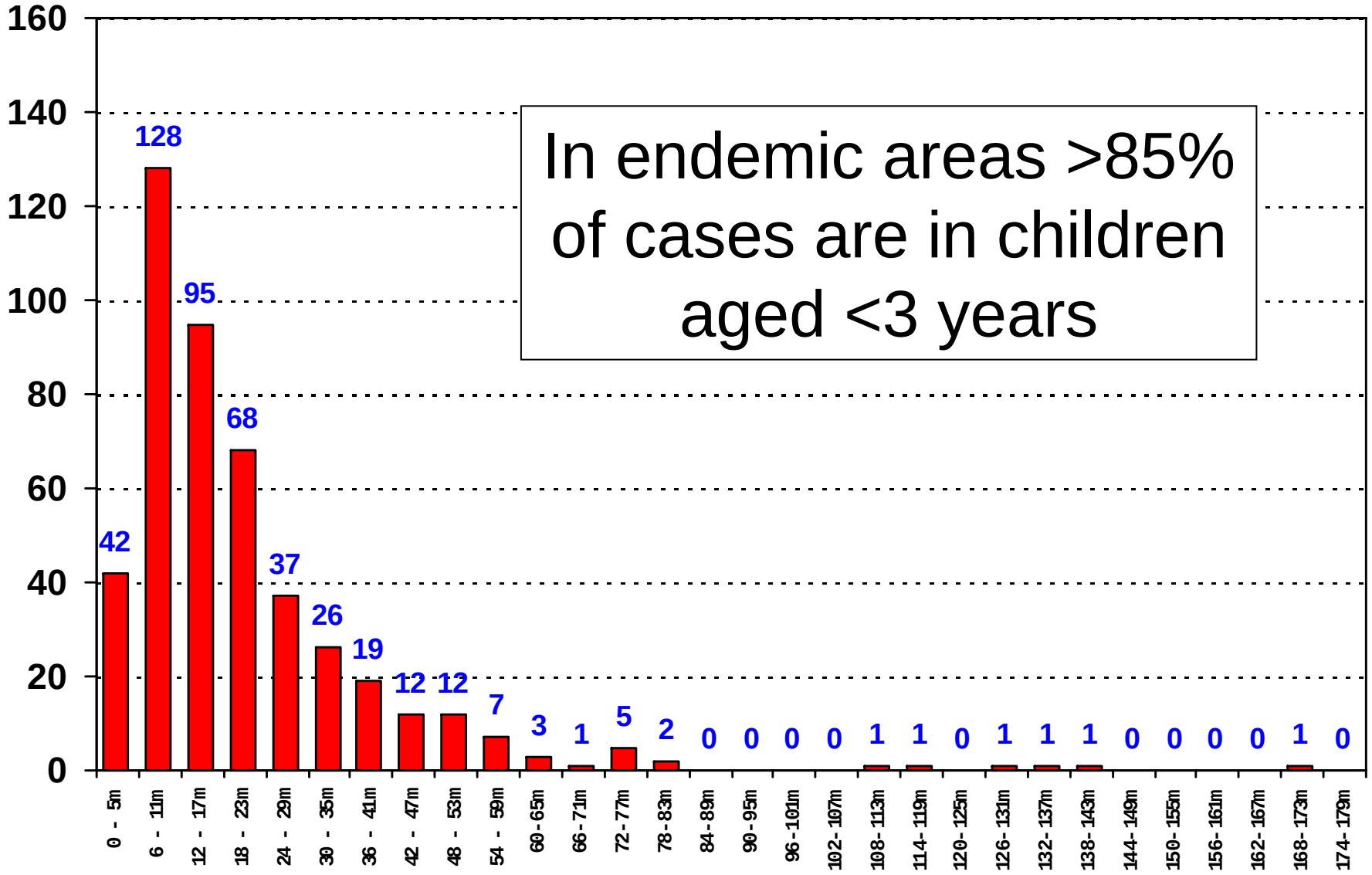
Polio type 1, Bihar



** data as on 18th August 2007*

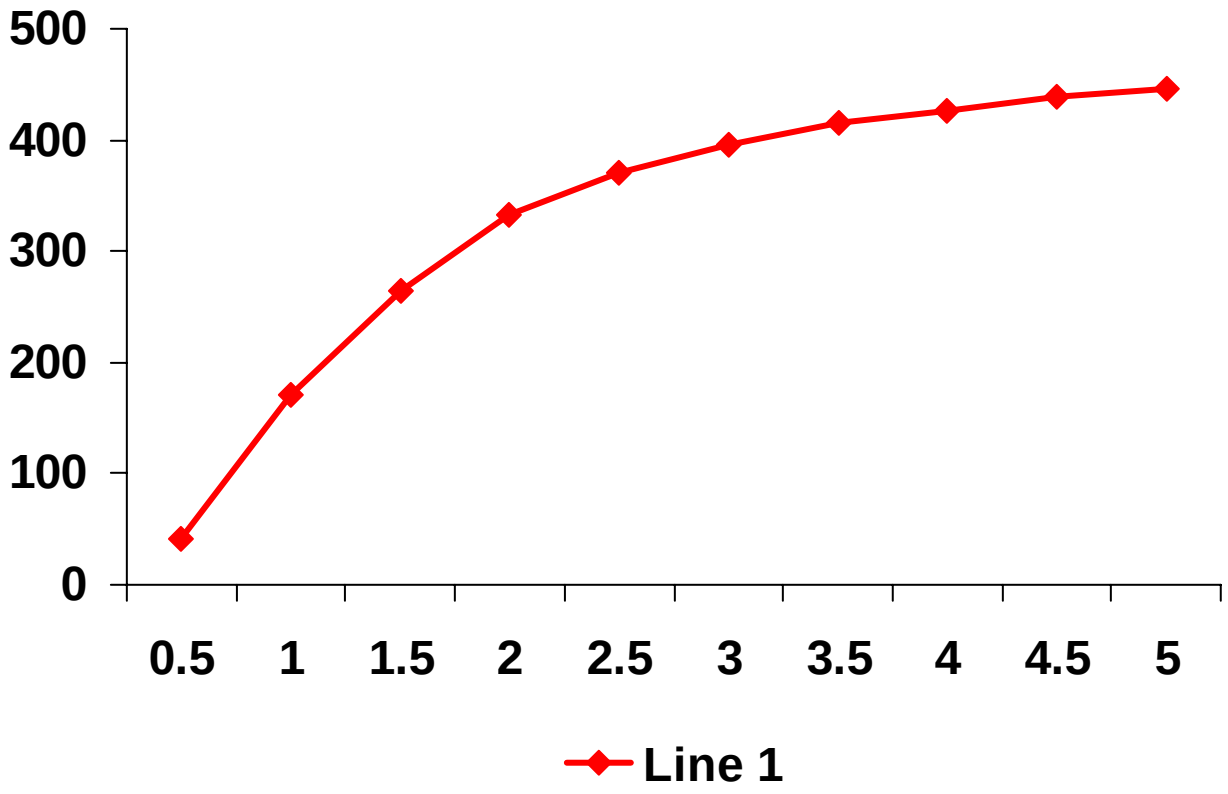
Polio - a disease of very young children

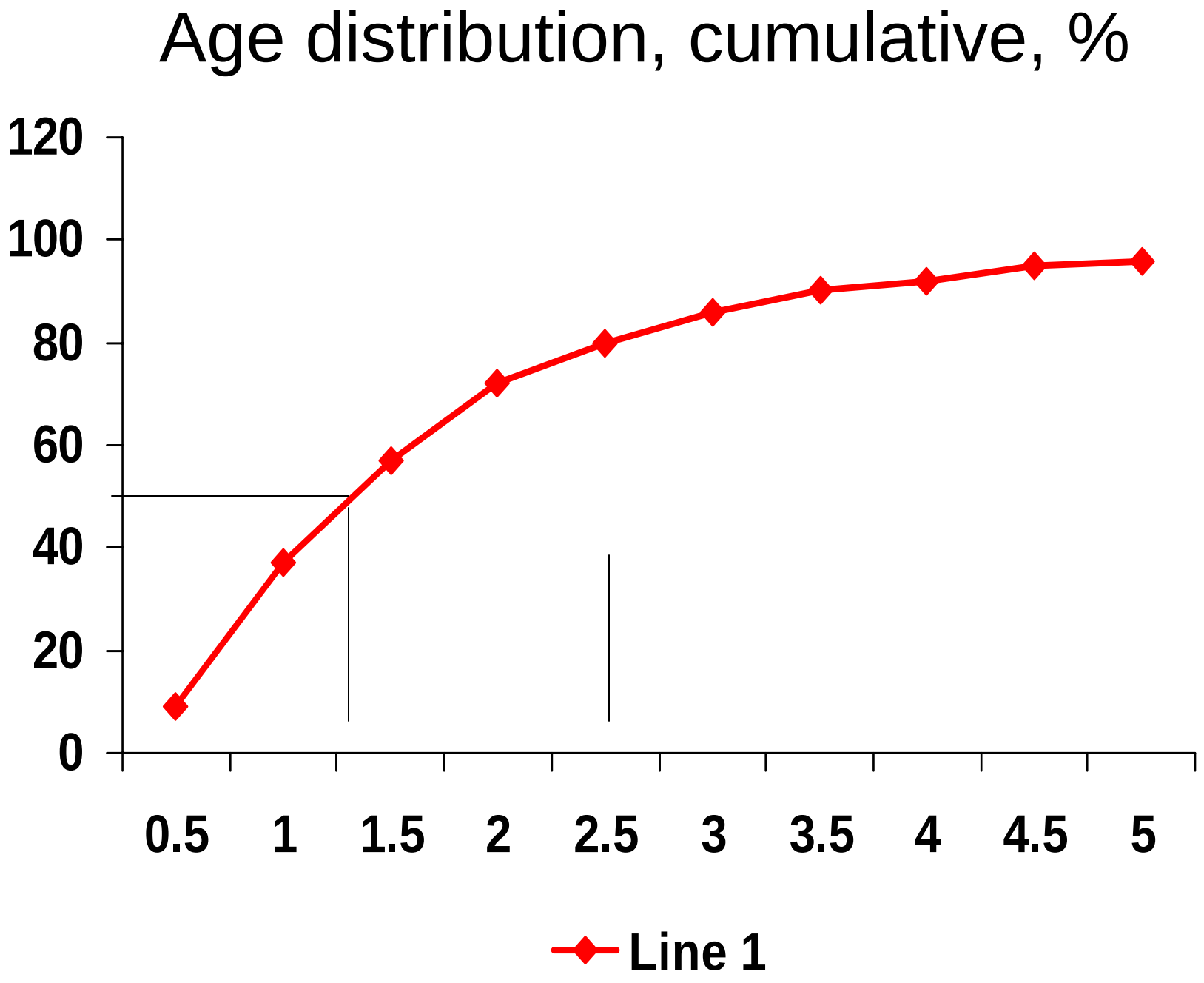
(P1 wild cases by age, Uttar Pradesh, 2006)



** data as on 9th December 2006*

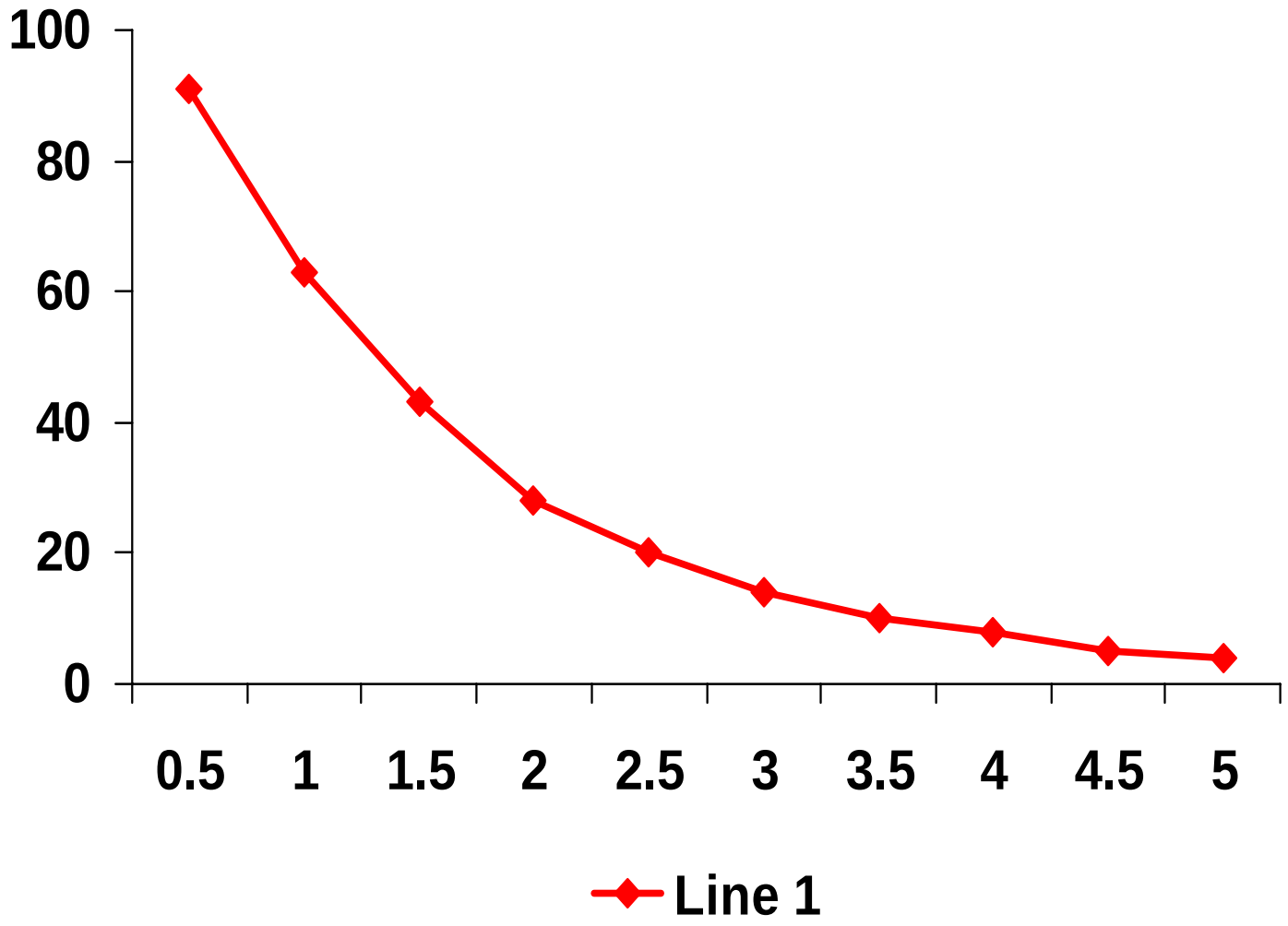
Age distribution, cumulative, cases




Age distribution, cumulative, %
120
100
80
60
40
20
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
Line 1

Age distribution of susceptibility

(mirror image of age distribution of cases)



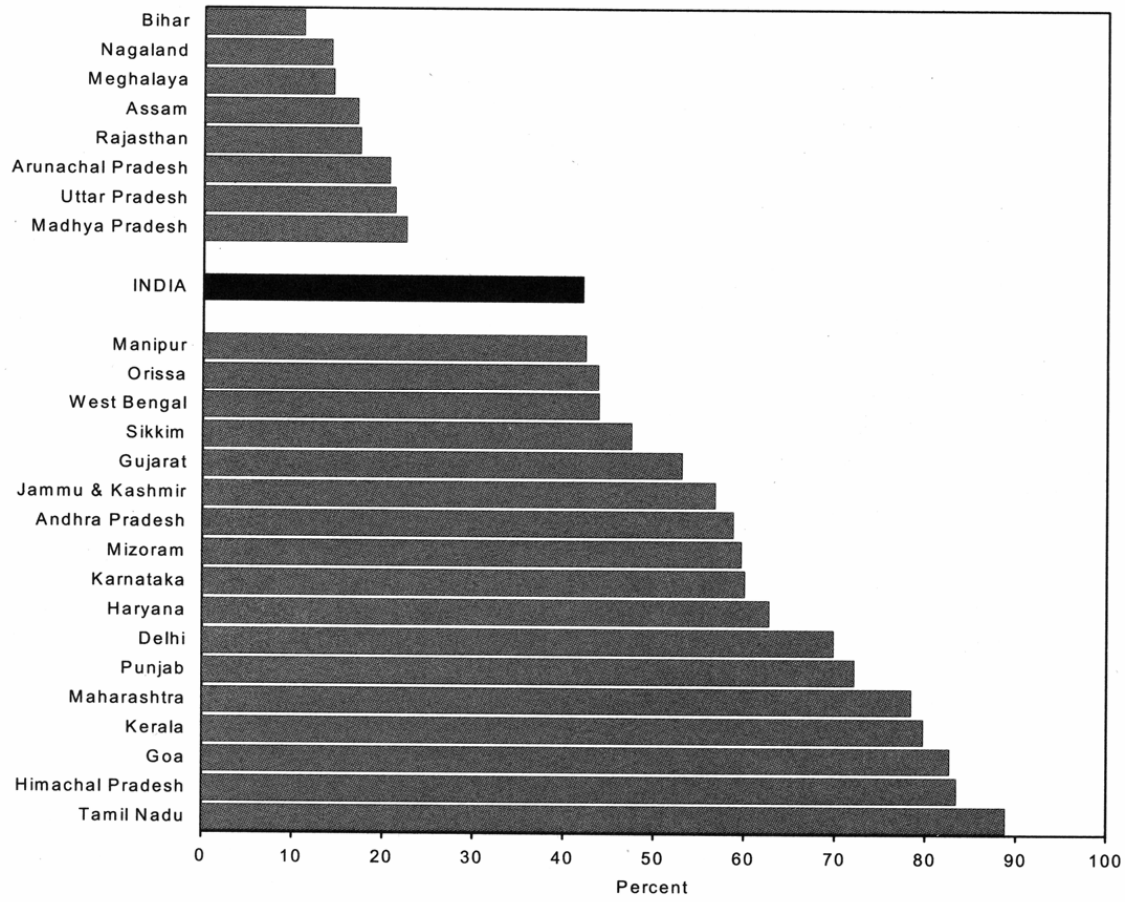
“Highly contagious” age profile

- 10% cases < 6 months

- Proves infection occurs very early; cases few due to maternal antibody protection
- The crucial age for “immunization” to impact on wild virus circulation <4 months
- Critical role of efficient EPI missing in the program

- Speed of immunization has not “competed” with speed of wild virus (1 & 3)
- Note: GPEI focus on < 3 years!

Figure 6.7
Percentage of Children Age 12–23 Months Who Have Received All Vaccinations by State

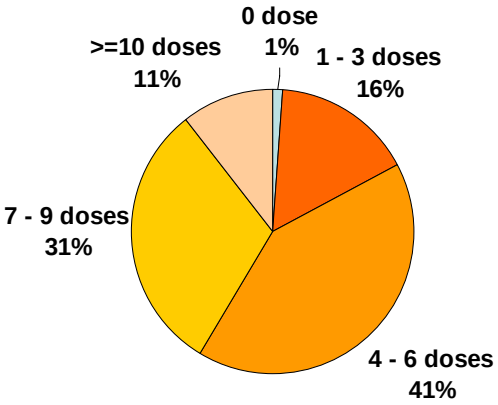


NHS-2, India, 1998–99

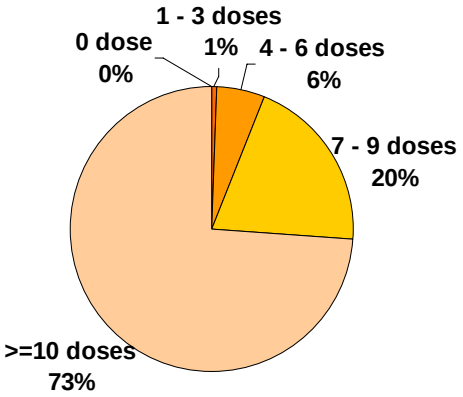
Immunity Gap persists in Children < 2 years

(OPV status of NPAFP cases, West UP – 2006)

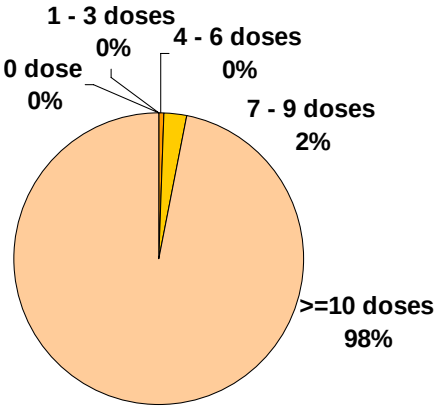
Less than 1 year



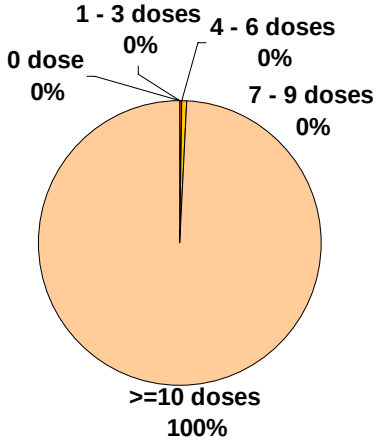
1 to 2 years



2 to 3 years



3 to 5 years



OPV coverage, multiple doses, is:

- Function of age

- Above 1 year fairly well vaccinated
- Above 2 near 100% with 10 or more doses

- But <1 year only 11% with 10 or more doses
- 17% less than 4 doses; 58% <7 doses

vaccine-induced immunity must overtake the speed of wild virus transmission

- That can be achieved by two pronged approach:
- High EPI coverage with mOPV-1 four times <4 months
- Or, IPV-DPT at 6-10-14 weeks

PLUS

- 3 campaigns at low season with mOPV-1 & mOPV-3
- Annually, until transmission is interrupted

Build on success of type 2 eradication

- Type 2 wild virus was eradicated globally by October 1999

- OPV type 2 no longer necessary from wild virus viewpoint; its current function is only to preempt cVDPV-2
- That is just putting off the “evil day”

- Either do the “experiment” or avoid it by early transition to IPV. We confine ourselves to wild virus eradication

THANK YOU